CLAIMS

We claim:

1. A process for filling gaps during integrated circuit production, comprising:

providing a gas mixture comprised of silicon-containing, oxygen-containing, and fluorine-containing components and comprising of one inert component, wherein said inert component is selected from the group consisting of helium and hydrogen; and

depositing a film over said gaps by using said gas mixture for simultaneous CVD and sputter etching using a plasma of uniform plasma density.

2. The process of Claim 1, wherein said fluorine-containing component is SiF_4, Si_2F_6, or SiH_2F_2.

3. The process of Claim 1, wherein said gas mixture further comprises neon.

4. The process of Claim 1, wherein said gas mixture further comprises argon.

5. The process of Claim 1, wherein said gas mixture further comprises nitrogen.

6. The process of Claim 1, wherein said gas mixture consists of two inert components, hydrogen and helium.

7. The process of Claim 1, wherein said gas mixture consists of one inert component, helium.

8. The process of Claim 7, wherein said He is at a flow rate of 10 to 2000 sccm.

9. The process of Claim 1, wherein said gas mixture consists of one inert component, hydrogen.

10. The process of Claim 9, wherein said hydrogen is at a flow rate of up to 5000 sccm.

11. The process of Claim 2, wherein said fluorine-containing component is at a flow rate of 10 to 250 sccm.

12. The process of Claim 1, further comprising applying a radio frequency bias to the substrate.

13. The process of Claim 12, wherein said applying comprises:

supporting the substrate on a substrate holder having an electrode; and

supplying said radio frequency bias to the substrate, the radio frequency bias being generated by supplying the electrode with at least 0.15 W/cm^2 of power.

14. The process of Claim 12, wherein the radio frequency bias applied to the substrate is at the frequency range between about 100 kHz and 27 MHz.

15. A process for filling gaps during integrated circuit production, comprising:

depositing a film over said gaps by HDP deposition using a gas mixture comprised of silicon-containing, oxygen-containing, and fluorine-containing components and comprising of one inert component, wherein said inert component is selected from the group consisting of helium and hydrogen, and wherein plasma utilized in the HDP deposition has a uniform plasma density greater or equal to or equal to $5x10^9$ electrons per cubic centimeter.

16. The process of Claim 15, wherein said fluorine-containing component is SiF_4, Si_2F_6, or SiH_2F_2.

17. The process of Claim 15, wherein said gas mixture further comprises neon.

18. The process of Claim 15, wherein said gas mixture further comprises argon.

19. The process of Claim 15, wherein said gas mixture further comprises nitrogen.

20. The process of Claim 15, wherein said fluorine-containing component is at a flow rate of 10 to 250 sccm.

21. The process of Claim 15, further comprising applying a radio frequency bias to the substrate.

22. The process of Claim 21, wherein said applying comprises:

supporting the substrate on a substrate holder having an electrode; and

supplying said radio frequency bias to the substrate, the radio frequency bias being generated by supplying the electrode with at least 0.15 W/cm^2 of power.

23. The process of Claim 21, wherein the radio frequency bias applied to the substrate is at the frequency range between about 100 kHz and 27 MHz.

24. The process of Claim 15, wherein said gas mixture consists of one inert component, helium.

25. The process of Claim 15, wherein said gas mixture consists of one inert component, hydrogen.

26. A process for filling gaps during integrated circuit production, comprising:

providing a substrate in a high density plasma CVD reactor;

providing a gas mixture comprised of silicon-containing, oxygen-containing, and fluorine-containing components and comprising one inert component, wherein said inert component is selected from a grouping consisting of helium and hydrogen; and

depositing a film over said gaps by using a plasma of uniform plasma density and by using said

gas mixture for simultaneous CVD and sputter etching.

27. The process of Claim 26, wherein said fluorine-containing component is SiF_4, Si_2F_6, or SiH_2F_2.

28. The process of Claim 26, wherein said gas mixture further comprises neon.

29. The process of Claim 26, wherein said gas mixture further comprises argon.

30. The process of Claim 26, wherein said gas mixture further comprises nitrogen.

31. The process of Claim 26, further comprising applying a radio frequency bias to the substrate.

32. The process of Claim 31, wherein said applying comprises:

supporting the substrate on a substrate holder having an electrode; and

supplying said radio frequency bias to the substrate, the radio frequency bias being generated by supplying the electrode with at least 0.15 W/cm^2 of power.

33. The process of Claim 31, wherein the radio frequency bias applied to the substrate is at the frequency range between about 100 kHz and 27 MHz.

34. The process of Claim 26, wherein said gas mixture consists of one inert component, helium.

35. The process of Claim 26, wherein said gas mixture consists of one inert component, hydrogen.